

From: Tzhone, Stephen
To: [Huling, Scott](#)
Cc: [Sanchez, Carlos](#); [Berg, Marlene](#); [Bartenfelder, David](#); [Poore, Christine](#); ["Telisak, Theodore"](#); ["Snyder, Jay"](#); ["Moix, Mark"](#)
Subject: RE: Arkwood SF site - photo-lineament/joint and fracture orientation study relative to the EPA ground water strategy
Date: Thursday, October 08, 2015 4:17:00 PM

Thanks Scott. My management wanted to make sure HQ was fully integrated and satisfied with the gw path forward. With your final analysis, I'll be completing the comments letter back to McKesson.

Thanks,

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From: Huling, Scott
Sent: Thursday, October 08, 2015 4:08 PM
To: Tzhone, Stephen
Subject: Arkwood SF site - photo-lineament/joint and fracture orientation study relative to the EPA ground water strategy

Stephen,

The RI report was reviewed as it pertained to the photo-lineament and the joint and fracture orientation study. In section 3.4, it was reported that there is little evidence to suggest preferential fracture of joint orientation. In the joint and fracture orientation study, it was reported that joints and major fractures were identified as relatively planar breaks and were quite numerous. There were other general observations made regarding these matters, however, this does not change the technical issues raised in previous correspondence nor in the ground water strategy.

Specifically, the ground water transport at the site moves in multiple directions which is not disputed by any of the parties involved. Ground water near the former sinkhole-disposal area generally moves in the westerly direction and at least partially emerges in New Cricket Spring. The extent to which contaminated ground water is captured by New Cricket Spring is entirely unclear. The extent to which lineaments, fractures, or joints are involved in that transport process is also unclear. Nevertheless, hydraulic short circuiting, as opposed to Darcian ground water flow clearly occurs between the sinkhole area and New Cricket spring as per the documented transport phenomena between these two locations reported in various reports.

The technical issues raised in previous correspondence regarding incomplete capture, multiple



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ground water transport directions, etc., are still applicable. Currently, (1) we know that one of the dominant ground water solute transport directions from the sinkhole area is to the west towards New Cricket Spring, but there could be other transport directions, and (2) it is highly probable and reasonable to conclude that New Cricket Spring does not capture all of the contaminated ground water leaving the site. There are multiple lines of evidence supporting this observation, and the fracture, joint, and lineament studies do not change these observations.

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